GeometryEditor and GeoSite Release Status and New Features

Xun Lai

July 16, 2008

Announcement on Math Forum Discussion geometry.software.dynamic

- Announcement on 2/25/2008
- It’s a very inactive mailing-list
  - http://mathforum.org/kb/forum.jspa?forumID=131&start=0
  - geometry-software-dynamic@support1.mathforum.org
  - Two to three topics per month
- Active members seem to be experts in interactive geometry software, but not ordinary school teachers
  - Originators of other geometry systems
  - Expert users

Announcement on Yahoo news group svg-developer

- Announcement on 6/15/2008
- It’s an active mailing-list for SVG people
  - http://tech.groups.yahoo.com/group/svg-developers/messages
  - svg-developers@yahoogroups.com
  - Three to four topics per day
- Few group members are interested in Math education

Current users

- http://boar.cs.kent.edu/geosite/
  - Click the “User List” at the bottom
- One manipulative created by user *rossisen*
  - *figgauge*: http://boar.cs.kent.edu/geosite/view.php?id=_mXghrVq6irT9AM
  - User *rossisen* has maintained a blog illustrating a couple of math concepts
    - http://mathfest.blogspot.com/2008/02/fibonacci-gauge-part-2.html
    - He uses the manipulative created on the GeoSite to illustrate a math topic in his blog.

Ways to boost GeometryEditor and GeoSite

- Find the right communities to publicize GeometryEditor and GeoSite
  - The announcements on the previous two communities were not so successful

Ways to boost GeometryEditor and GeoSite (cont.)

- Continuingly improve GeometryEditor's authoring support and functionality of GeoSite

Ways to boost GeometryEditor and GeoSite (cont.)

- Need to provide more ready-to-use manipulatives and educational pages
  - Pages contains not only manipulative(s) but also text contents
  - *nine point circle*
    - http://boar.cs.kent.edu/geosite/view.php?id=_mLKZfRNS8nzwd8
  - *reflection point about a circle*
    - http://boar.cs.kent.edu/geosite/view.php?id=_mchgu3VTm7REiB
  - *equilateral triangle with vertices on three circles*
    - http://boar.cs.kent.edu/geosite/view.php?id=_m1kIrnPmPqVT5N
- Plan phases:
  - Phase 1: Make around 50-100 pages (very time consuming) by myself
  - Phase 2: Attract a group of expert users who are interested in authoring sophisticated manipulatives and pages
  - Phase 3: Attract ordinary users to use existing pages

New features

- Since last presentation (Feb 4, 2008)
- Now working under Firefox 1.5+, Opera 9+, Safari 3.1+, and Windows IE with ASV
- Authoring geometric objects under two modes
  - Select a menu item first, and then select object(s) to apply the operation (Cabri and most other systems)
  - Select object(s) first, and then select a menu item to apply an operation (SketchPad)
  - GeometryEditor is the only one that supports both modes

New features (cont.)

- Macro-based (user-defined) tools behave the same as system-defined tools
  - GeometryEditor is the only one that achieves this goal
- Powerful macro wizard
- Powerful recursion wizard
- Tool signature window
- Object list window
- Great improvement on the response speed of recursions
- Logical measurements
- Treating measurements as expressions
- Maintaining expression/text object’s position relative to a point

Features I am working on

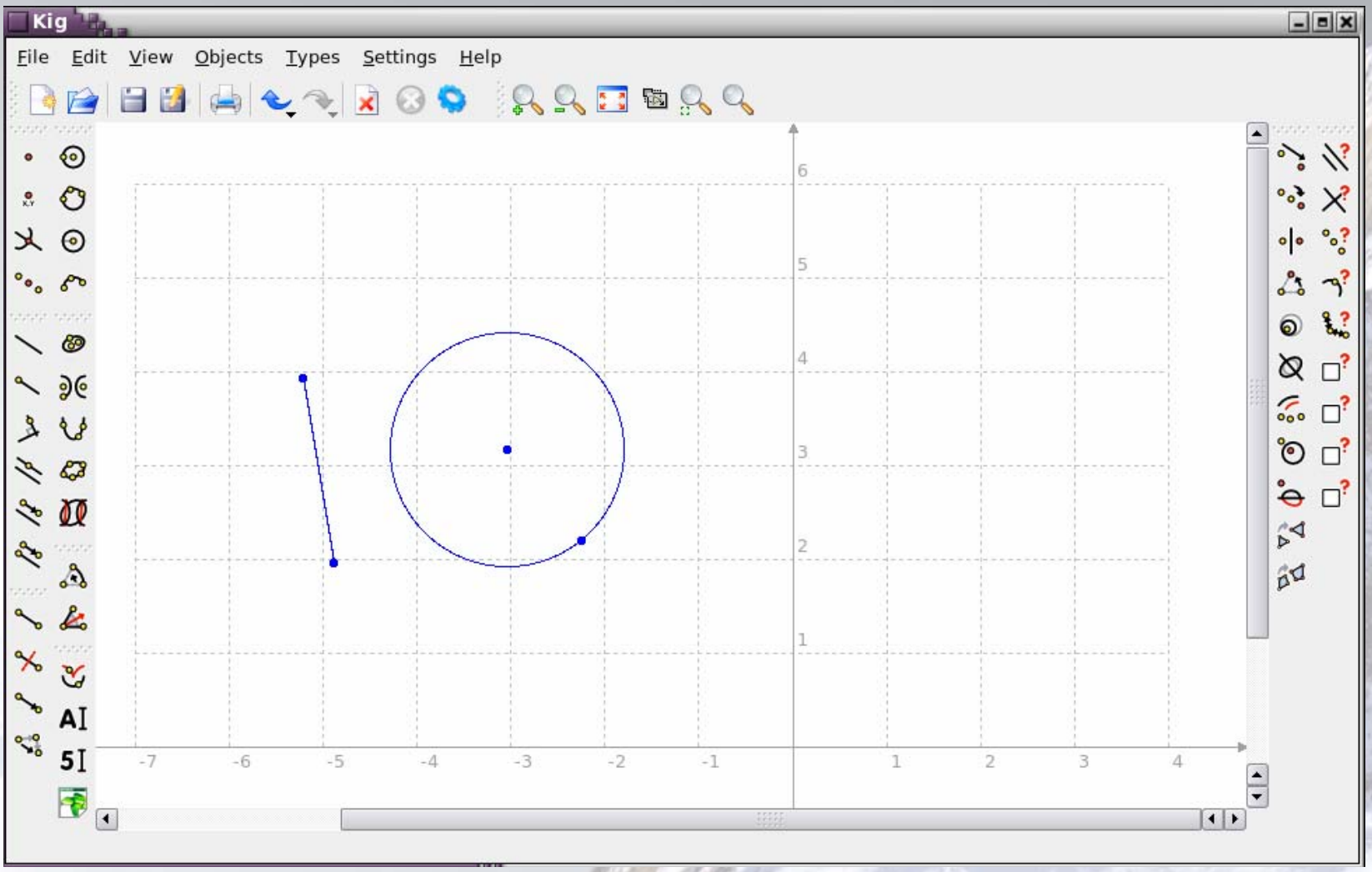
- Conic sections
- More sophisticated coordinate system support (difficult)
  - Unit length determined by an expression
  - Circular dependency
- Integration with Maxima

Major planned work

- Pluggable object types
- Interactive drawing between two users
- Packaging the Geometry system and the GeoSite system, and placing them *SourceForge* and *Google Code*
- Apply for a domain to host GeoSite
  - boar.cs.kent.edu/geosite looks like a testing Web site

Object types: many or few

- In “Lifting the Curtain: The Evolution of The Geometer's Sketchpad”, it has discussed how many menu items should be provided
  - http://math.coe.uga.edu/TME/v10n2/4scher.pdf
  - As fewest menu items as possible plus macro (user-defined tool)
    - No direct menu item for the creation of a circle through three points
- Kig on Linux
  - Has a direct support for creation of a circle through three points



Kig supports lots of objects

Object types: many or few (cont.)

- How to judge if the system should provide native support for creating an object in a particular way?

Object types: many or few (cont.)

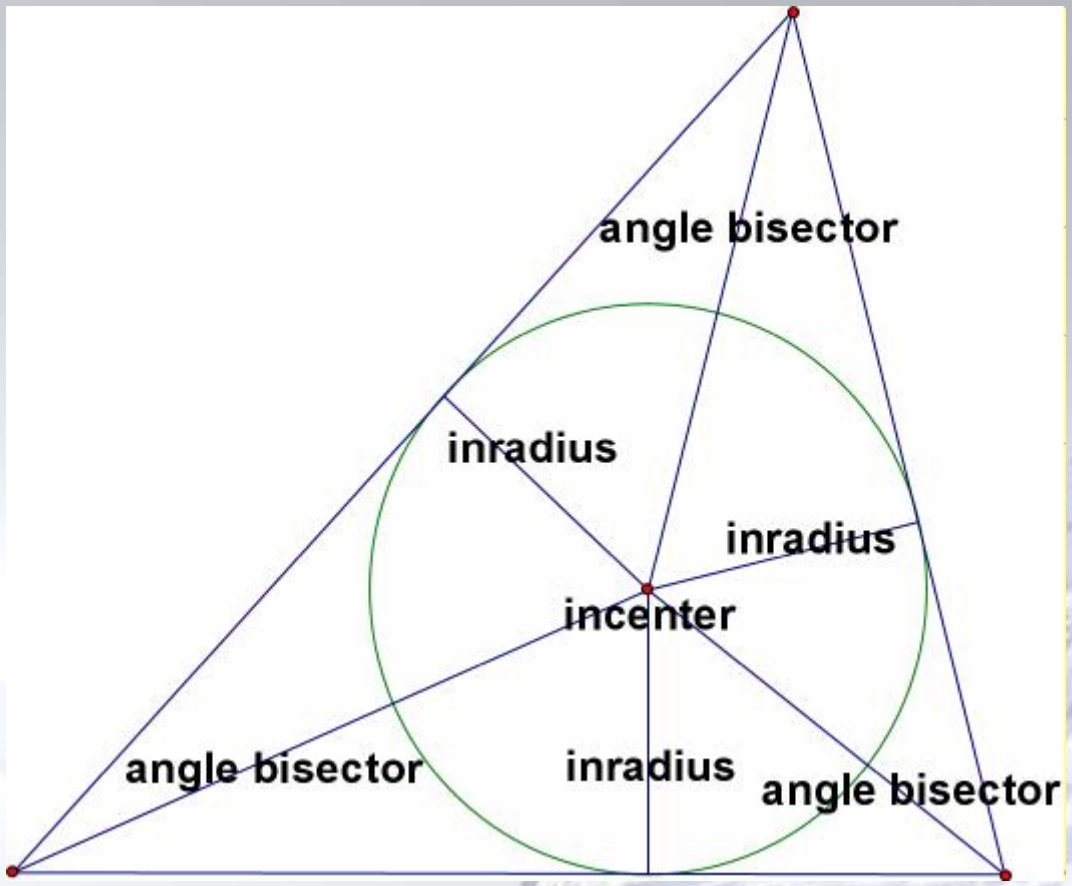
- As many as possible?
  - Overwhelming user interface
  - Not good for a Web-based application
  - You never know what other object types are needed
    - An interesting example: Triangle Centers
      - http://faculty.evansville.edu/ck6/encyclopedia/ETC.html
- As fewest as possible plus macro?
  - Not good for fast authoring
  - Macro-based tools create lots of hidden assistant objects
- Neither solution is desirable

Pluggable object types

- Proposed solution: Pluggable object types
- Observation: position and attributes of most geometric objects can be determined by algebraic formula
  - Mid-point of a segment
    - x=(s.x1+s.x2)/2
    - y=(s.y1+s.y2)/2

Pluggable object types (cont.)

- Incenter and inscribed circle of a triangle
  - Incenter: the point of concurrence of the interior angle bisectors of triangle ABC
  - Inradius: the distance from the incenter to one side
  - Incircle: centered at the incenter with radius equal to the inradius



Incenter and inscribed circle (from mathwords.com)

Pluggable object types (cont.)

- Steps of calculation of incenter and inradius

  a = dist(B, C)

  b = dist(C, A)

  c = dist(A, B)

  x = (a*A.x + b*B.x + c*C.x)/(a+b+c)

  y = (a*A.y + b*B.y + c*C.y)/(a+b+c)

  inradius = 2*area(A, B, C)/(a+b+c)

  incenter = Point(x, y)

  incircle = CircleWithCenterAndRadius(incenter, inradius)

Pluggable object types (cont.)

- When a direct algebraic computation is possible, there is no need take complex multiple steps to create an object
- Besides understanding the underlying math, fast authoring should be a goal of a geometry system
  - A scenario can be
    - Understanding how to create the incenter is not the major goal
    - Fast creation of an incenter for further authoring of other objects is the major goal

Pluggable object types (cont.)

- XML syntax to describe steps to create object(s)
  - Provided by the system or the users
  - An environment for ordinary users to declare the steps, and the XML file is generated automatically
  - Schema and a testing environment to do the validation of the steps
- A user can assemble the authoring environment
  - Works like plug-in
  - Loaded by AJAX
- A teacher can customize different authoring environment profiles for students

Interactive drawing between two users

- Active and passive
- Difficulties:
  - Mouse movement
  - Menu pulling down

Final Release

- Packaging the Geometry system and the GeoSite system, and placing them *SourceForge* and *Google Code*
- Apply for a domain to host GeoSite
  - boar.cs.kent.edu/geosite looks like a testing Web site